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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/230,069	04/25/2000	MORDECHAI SEGAL	299.004US2	4909
23494	7590	10/26/2004	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED P O BOX 655474, M/S 3999 DALLAS, TX 75265			LUGO, DAVID B	
			ART UNIT	PAPER NUMBER
			2637	

DATE MAILED: 10/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/230,069

Applicant(s)

SEGAL ET AL.

Examiner

David B. Lugo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 August 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 16 is/are allowed.
- 6) ☒ Claim(s) 1, 2, 4-6, 15, 17 and 20-22 is/are rejected.
- 7) ☒ Claim(s) 7-14, 18 and 19 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 8/19/04 have been fully considered but they are not persuasive.
2. Regarding claims 1 and 20, applicant argues that de Lantremange does not disclose the adaptation formula as added to the claims. However, each element of the formula added to the claims can be made to relate to the coefficient update algorithm shown by de Lantremange in column 10, equation 6: p_{n+1} corresponds with $C_{i,n+1}$, p_n corresponds with $C_{i,n}$, $s_1[n-l]$ corresponds with x_{n-i} , s_2 corresponds with y , and $\Gamma(.)$ as a function whose parameters may depend upon a symbol index n , corresponds with the term in parentheses in equation 6 multiplied by α . Thus, de Lantremange is considered to meet the limitations of claims 1 and 20, as amended.
3. Regarding claim 17, applicant argues that there is no suggestion to combine the references. However, specific suggestion to combine the references is explicitly provided in Chalmers, as stated in the previous Office action.
4. Accordingly the rejections of claims 1, 2, 4-6, 15, 17 and 20-22 are maintained.

Specification

5. The disclosure is objected to because of the following informalities:

In the amendment to the specification filed on 10/7/02, the replacement of the paragraph beginning on page 5, line 30 and ending on page 6, line 13 of the specification does not show the symbol for " \geq " listed in the fourth and sixth lines of the paragraph as originally filed in the application (the symbol is represented by a rectangular box in the paper copy filed). Appropriate correction is required.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1, 4, 15 and 20-22 are rejected under 35 U.S.C. 102(e) as being anticipated by de Lantremange U.S. Patent 5,970,093.

8. Regarding claims 1 and 20, de Lantremange discloses in Figure 1 a receiver in a communication system, which inherently comprises a transmitter, the receiver comprising front end unit (20, 24) for performing A/D conversion, demodulation and timing control, a digital equalizer connected to the front end and comprising a first filter 32 and a second filter (Fig. 1B) for reducing noise and intersymbol interference without training data, and inherently comprising a symbol to bit converter for converting the symbol information to a digital bitstream, where the first filter comprises adaptive coefficients where adaptation depends only on prior inputs and output of the filter, and in equation 6 shown in column 10: p_{n+1} corresponds with $C_{i,n+1}$, p_n corresponds with $C_{i,n}$, $s_1[n-l]$ corresponds with x_{n-i} , s_2 corresponds with y , and $\Gamma(\cdot)$ as a function whose parameters may depend upon a symbol index n , corresponds with the term in parentheses in equation 6 multiplied by α (see col. 10 – equation 6, Fig. 1A).

9. Regarding claim 4, de Lantremange disclose in Fig. 1B that the second filter comprises a phase rotator 42.

10. Regarding claim 15, de Lantremange shows that the modulated signal is a QAM signal.

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11. Regarding claim 21, the intended use of the receiver with a digital subscriber loop of a telephone network is not given patentable weight.

12. Regarding claim 22, the receiver is used with a cable television infrastructure.

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over de Lantremange in view of White U.S. Patent 4,005,426.

15. Regarding claim 2, de Lantremange does not disclose that the first filter operates to reduce the eigenvalue spread of the input signal.

16. White discloses an adaptive signal preprocessor that reduces eigenvalue spread, as stated in column 5 lines 40-44.

17. It would have been obvious to one of ordinary skill in the art to use a signal preprocessor that reduces eigenvalue spread as taught by White, in the receiver of de Lantremange to allow the receiver to settle quickly, as stated by White in column 5 lines 40-44.

18. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over de Lantremange in view of Nikias et al. U.S. Patent 5,282,225.

19. Regarding claim 5, de Lantremange discloses that the second filter comprises a feedback network for removing ISI as shown in Fig. 1B, but does not disclose that it is a nonlinear feedback network.

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20. Nikias et al. disclose an adaptive equalizer with a nonlinear feedback network in Fig. 5A.

It would have been obvious to one of ordinary skill in the art to use the nonlinear feedback network taught by Nikias et al. in the equalizer of de Lantremange in order to provide a rapid adjustment of the equalizer coefficients without using a training sequence (see abstract).

21. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over de Lantremange in view of Ramm et al. U.S. Patent 5,568,558.

22. Regarding claim 6, de Lantremange discloses that the first filter comprises an FIR filter, considered to have a first fixed coefficient, but does not state that its taps are adjusted so its output power is minimized.

23. Ramm et al. disclose an adaptive filter where coefficients are determined to minimize the output power (see abstract).

24. It would have been obvious to one of ordinary skill in the art to minimize the output power to reduce energy consumption and thereby reducing costs.

25. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over de Lantremange in view of Chalmers U.S. Patent 5,640,416.

26. Regarding claim 17, de Lantremange discloses an adaptively equalized self-recovering receiver in a communications system shown in Fig. 1 where A/D conversion and demodulation are performed, the signal is adaptively pre-equalized 32, the pre-equalized signal is adaptively equalized to reduce the ISI without the use of training data (Fig. 2B), and where the complex valued symbol signal is converted to a digital signal. In the receiver of de Lantremange, the signal to conversion to baseband is performed prior to A/D conversion and thus does not disclose

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that the analog signal is converted to a digital signal prior to baseband conversion, where the digital signal is multiplied with sine and cosine signals to produce the digital baseband signals.

27. Chalmers discloses converting a received signal from analog to digital via A/D converter 301, and multiplying the digital signal with sine and cosine signals to produce digital baseband signals (Fig. 3).

28. It would have been obvious to one of ordinary skill in the art to perform A/D conversion prior to converting the signal to baseband by multiplying the digital signal with sine and cosine signals, as taught by Chalmers, in the receiver of de Lantremange as only a single A/D converter is required and DC offsets can be easily removed, as stated by Chalmers in col. 2, lines 40-44.

Allowable Subject Matter

29. Claim 16 is allowed.

30. Claims 7-14, 18 and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and amended to overcome the objections set forth in this Office action.

31. The following is a statement of reasons for the indication of allowable subject matter:

The reference de Lantremange discloses a receiver having a digital equalizer comprising a first filter and a second filter, but does not disclose that the second filter comprises an FIR filter whose taps are adjusted according to the formula as defined in claim 7 which depends on a sum of the output of the second filter and a decision feedback filter, where the decision feedback is a backward FIR filter whose taps are adjusted according to the formula listed in claim 7.

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The prior art of record further fails to teach receiving a digital communication signal having an adaptive pre-equalizer for adaptively filtering a received complex-valued digital signal to produce a filtered digital signal, summing the complex-valued digital signal with the filtered signal to produce a pre-equalized digital signal, producing a non-linear response to the pre-equalized signal, and modifying the taps of the adaptive filter in response to the non-linear response to the pre-equalized digital signal and the complex-valued digital signal, as recited in claims 16 and 18.

Further, the prior art of record fails to teach a method of receiving a digital communication signal where adaptively equalizing further comprises the steps of adaptively rotating the pre-equalized complex-valued digital signal to produce a rotated signal, adaptively filtering the rotated signal to produce a filtered rotated signal, summing the filtered rotated signal with an adapted filter output to produce an adapted complex-valued signal, detecting symbols in the adapted signal to produce a corrected symbol signal, and producing the adapted filter output by adaptively filtering the corrected symbol signal, as recited in claim 19.

Conclusion

32. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period

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will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **David B. Lugo** whose telephone number is **(571) 272-3043**.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Jay Patel**, can be reached at **(571) 272-2988**.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
P.O. Box 1450
Alexandria, VA 22313-1450

or faxed to:

(703) 872-9306

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dl
10/20/04


KHAI TRAN
PRIMARY EXAMINER *10/25/04*